UNIT I   **INTRODUCTION TO INTERNET**   **LESSON1**

1.0 Objective

This lesson introduces you the basic concepts of internet, it also deals with the resources needed to access the Internet. On completion of this unit you will be able to

- Explain the evaluation of Internet
- Establish an Internet connection
- Explain the role of Internet Services

1.1 Introduction

Let us start with a small example, imagine that, you are working as a marketing manager in a Company ABC, that has branches over various locations, and you want to know the details of the sales of your company over various branches, one solution is by visiting through various branches and collecting information about the sales, the second solution is, by connecting the computers at your branches through a network. This allows you to complete your assignment from your seat itself.

Networking of computers allows sharing of the resources among themselves. When you connect two computers so that they can communicate, you form a network. You can also connect two or more networks to form an internet-network or Internet.

The Internet is the word used to describe the massive world-wide network of computers. The word "Internet" literally means, "Network of networks". Internet is super-network of millions of interconnected computers and million of users.

1.2 History behind the formation of Internet

The internet is the interconnection of thousands of networks. The ARPANET began as a US Government experiment back in 1969. ARPA , the Department of Defence(DoD) advanced research project agency, initially linked researchers with a remote computer centers, allowing them to share hardware and software resources such as computer disk space, databases and computers. Later, this was shortened as "Internet".

The network operated with a technique called *packet switching*, in which the digital data is transmitted in small bundles called packets. These packets contain the information about the address, error control and the order in which packets are to be sent. The address information allows the packets to trace the route to their destination. The sequencing information allows the reassembling of the packets into their original order in destination. Packets from different senders were intermixed on

the same line. This technique greatly reduced the costs when compared with the dedicated communication line.

The network was designed to operate without centralized control. If a portion of network failed, the remaining working portions would still route packets from senders to receivers over alternative paths.

ARPANET used the Transmission Control protocol known as TCP for communication. TCP ensure that messages were properly routed from sender to receiver. More information about TCP protocols will be discussed later.

As the Internet evolved, organizations implemented World Wide Web for both intra organization (i.e. within the organization) and inter organization (i.e. between various organizations). A challenge was raised to communicate with different networks. ARPA solved the problem by developing the Internet Protocol (IP), which truly created the network of networks, the current architecture of Internet. The combination of IP and TCP is commonly referred as TCP/IP protocol.

Initially, the Internet usage was limited to universities, military organizations and research institutions. Eventually the government decided to allow access to the Internet for commercial purpose.

1.3 Getting connected to Internet

Before you can explore the Internet, you need to have access to a computer that is a part of network. When you buy a telephone, it doesn't work right out of the box. Before you make first call you need to pay, to have line connected by the telephone company, so that you can hear the dial tone. Similarly you can't dial the Internet's services until you modem can connect with a computer, that is part of the Internet. Once you have an "Internet dial tone" you will be able to access the Internet's resources.
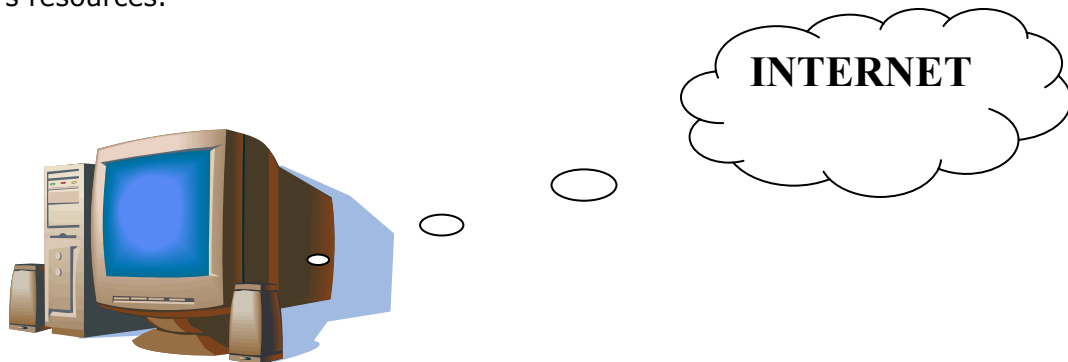
Individuals and small business companies can access the internet using a dialup connection. A dial-up connection simply mean that when you want to access the Internet, your modem dials a host computer and you can go about your business. Dial-up access means your phone line is only tied up while you're actually using the Internet.

If you're trying to connect to a large group of people who require connection simultaneously, extremely fast connections to the Internet, dial-up access is not the best choice. If you're connecting to more than 20 people who require silmultaneous

and permanent Internet connections, you may need that leased line, terminal server, router and other equipments. Those of us who need simple dialup access needs only a computer, a modem, a telephone line, an account with a service provider and the appropriate software. The following section describes the requirements that enable Internet access.

1.3.1 Modem

At first your computer must have a Modem. **Modem** (**mo**dulator-**dem**odulator) is a device that converts data to an analog signal that can be transmitted over telephone lines. The computer's digital information is transmitted as analog signal. At the receiving end the analog signal is converted to digital information in a readable form.

Modems are available in various forms. The standard interface for connecting the external modems to computers is called RS-232 interface. Consequently, any external modem can be attached to any computer that has an RS-232 port, which almost all computers have. Some modems come as an expansion board that you can insert into a vacant slot. This type is also called onboard or internal modems.

Internal Modem

While the Modem interfaces are standardized, a number of different protocols, for formatting data to be transmitted over telephone lines exist. Some like CCITT V.34 are official standards while others have been developed by private companies. Most of the Modems have built-in support for the most common protocols.

1.3.2 Network Interface Card

Your network card is also frequently called a Network Interface Card (NIC). Currently, the most common types of NIC used in homes and offices are Ethernet and wireless Ethernet cards. NIC is a hardware which allows your computer to connect through a network or a high–speed Internet Connection such as Local Area Network (LAN), cable modem or a Digital Subscriber Line (DSL).

Network interface card

1.4 Internet Services

The Internet Services can be provided to us through various technologies like dial-up, DSL, ISDN, and Wi-Fi etc. The following section will give you an idea about the various technologies used today.

1.4.1 Digital Subscriber Line (DSL)

DSL is a family of technologies that provide digital data transmission over the wires of a local telephone network. DSL originally stood for **digital subscriber loop**, although in recent years, many have adopted **digital subscriber line** as a more marketing-friendly term for the most popular version of consumer-ready DSL. They are sometimes referred to as last-mile technologies because they are used only for connections from a telephone switching stations.

DSL is similar to ISDN in as much as both operate over existing copper telephone lines and both require the short runs to a central telephone office(usually less than 20,00 feet). However, DSL offers much higher speeds-up to 32 Mbps for upstream traffic (Client to server), and from 32 Kbps to over 1Mbps for downstream traffic (server to client)

DSL Modem

1.4.2 Integrated Services Digital Network (ISDN)

Integrated Services Digital Network (**ISDN**) is a circuit-switched telephone network system, designed to allow digital transmission of voice and data over ordinary telephone copper wires, resulting in better quality and higher data speeds than are available with analog. More broadly, ISDN is a set of protocols for establishing and breaking circuit switched connections, and for advanced call features for the user. It allows voice, date, text, graphics, music, video and other source material to be transmitted over existing telephone wires.

ISDN applications include high-speed image applications, additional telephone lines in homes to serve the telecommuting industry, high speed file transfer, and video conferencing.

In a videoconference, ISDN provides simultaneous voice, video, and text transmission between individual desktop videoconferencing systems and group (room) videoconferencing systems.

1.4.3 Comparison of DSL-ISDN

- In terms of speed, DSL is better choice. It comes in scalable technology with speeds ranging from 128Kbps to 1.5 Mbps, while ISDN generally come in two flavors 64Kbps and 128 Kbps.
- DSL utilizes the copper wiring already installed into business and homes,
- ISDN also utilizes copper wiring, but a special ISDN line must be installed at customer's location.
- ISDN charges may vary depending upon whether or not the customer requires a dedicated, "always on" connection. Dedicated connections can get pricey as many ISDN packages are billed at per-minute cost. Special "dial-up ISDN" packages are available in most areas at a much-lower cost and can be a reasonable alternative in areas where DSL is not yet available.

1.4.4 Broadband and Base band Transmission

Broadband Internet access often shortened to just "broadband", is high speed Internet access—typically contrasted with dial-up access over modem. Dial-up modems are generally capable of a maximum bit rates of 56 Kbit/s (kilobits per second) and require the full use of a telephone line whereas broadband technologies supply at least double this speed and generally without disrupting telephone use. In contrast Base band allows only one signal at a time.

Most communication between computers, including the majority of local area networks uses only base band transmission.

1.4.5 Wi-Fi

Wi-Fi is a technology of accessing Internet through Wireless network. A Wi-Fi enabled device such as a PC, game console, cell phone, MP3 player or PDA can connect to the Internet when within range of a wireless network connected to the Internet.

Wi-Fi allows LANs to be deployed without cabling for client devices, typically reducing the costs of network deployment and expansion. Locations where cables cannot be run, such as outdoor areas and historical buildings, can host wireless LANs.

1.5 Summary

The word "Internet" literally means, "Network of networks". Internet is super-network of millions of interconnected computers and millions of users.

- ARPANET was started by US Government in 1969, which connected researchers with a remote computer centers, allowing them to share hardware and software
- TCP/IP is the internet protocol, specifies an addressing scheme for computers. TCP/IP sets the rule for how data should move between computers and programs on the network.
- Modem stands for modulator and demodulator, which convert the digital data into analog signal and vice versa.

- ISDN is mainly used in applications like videoconferencing and high speed file transfer.

1.6 Check your Progress

1. TCP/IP stands for ………………………
2. What is meant by Packet Switching?
3. Write short notes on modem.
4. Explain the evolution of Internet.
5. Compare DSL and ISDN.

1.7 Verify your Answers

1. Transmission Control Protocol/Internet Protocol

1.8 Activities

- Visit a browsing centre and collect more details about the Internet
- Prepare an assignment about Modem and its working
- Prepare an assignment to compare the various Internet Services.

UNIT I   **INTERNET PROTOCOLS**   **LESSON 2**

2.0 Objective
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2.3 Internet Protocols
      2.3.1 TCP/IP Essentials
      2.3.2 How TCP/IP works?
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2.10 Activities

UNIT I   **INTERNET PROTOCOLS**   **LESSON 2**

2.0 Objective

This lesson deals with the Protocols used in the internet. At the end of this lesson you will be able to

- Discuss the uses of TCP/IP on the Internet
- Describe the remote access protocol
- Describe the HTTP, FTP and its importance
- Explain the working of E-mail and its types.
- Explain the role of Search engines & list out popular search engines

2. 1 Introduction

In the previous lesson you had learnt about the evolution of Internet and the various resources needed to access the Internet. This lesson gives you a detailed working of protocols that are involved in the access of Internet.

2.3 Internet Protocols

The Internet protocol suite has many protocols in each layer. The following diagram depicts the internet protocol suite.

Five Layered TCP/IP suites

Layer	Protocol
Application Layer	DNS.DHCP.FTP.HTTP.IMAP.SMTP.POP3.IRC..
Transport Layer	TCP · UDP · DCCP · SCTP · RTP · RSVP · IGMP..
Network Layer	IP (IPv4 · IPv6) · OSPF · IS-IS · BGP · ARP · RARP · RIP · ICMP · ICMPv6 · (more)
Data Link Layer	LAN. Wi-Fi. Ethernet. Token ring. FDDI. ISDN(more)
Physical Layer	Modems. Optical Fiber. Coaxial cable, Twisted pair

2.3.1 TCP/IP Essentials

TCP/IP, stands for Transmission Control Protocol/Internet Protocol, is the name of a family of hundreds of data communications protocols used to organize computers into network. The computers that are connected to the Internet talks through TCP/IP protocols.

TCP/IP specifies an addressing scheme for computers on the Internet. TCP/IP sets the rule for how data should move between computers and programs on the network. Its protocols are rules that computers must follow in order to move different types of information from place to place. We will see some of the protocols that make up TCP/IP, like the FTP, Telnet and SMTP protocol.

2.3.2 How TCP/IP works?

Messages sent over TCP/IP are called packets. Each packet of information sent over the Internet can be thought of as a letter. TCP/IP puts each letter in an envelope, addresses the envelope with "To" and "From" information, and sends the letter on its way. These packets are designed to be small, usually 1500 bytes or so.

Most things you send and receive on the Internet (e-mail messages and files) are not longer than the maximum packet size. Hence TCP/IP breaks the message up into packet-sized chunks, addresses each packet and sends them on their happy way.

Once at their destinations (actually getting them there is another story), TCP/IP reassembles the packets into one full continuous message. At the destination the IP verifies the labels, and pass them to the TCP. The TCP at the destination checks if all the packets have been received. If any of the packets are missing, then it informs this to the source TCP and requests the packets to be sent again. After this finally verifies the order and supplies to the destination

Getting a message from its source to its destination is fairly painless to understand. The internet is a store and forward network, meaning that those packets can be sent to any number of computers on their way to their destination. If there is a direct network link between two sites, that is, a physical cable linking the two computers the packets can zip right over.

Most of the time, there isn't a direct link. Therefore, the sending computer sends the packets to one, that's little closer to the destination. The machine moves the packets further down the line and so on, until the packets reach their goal. It's no uncommon for a cross-country message to make 20 or 30 hops. Usually it all happens quickly. Open a telnet connection from Boston to New York or London and you'll hardly notice any delay.
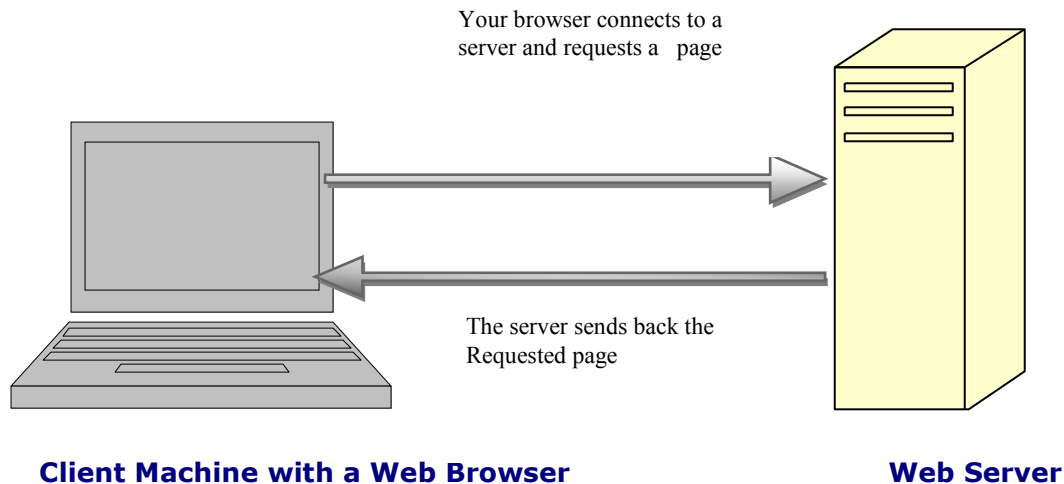
2.3.3 User Datagram Protocol (UDP)

User Datagram Protocol (UDP) is one of the core protocols of the Internet protocol suite. Using UDP, programs on networked computers can send short messages sometimes known as *datagram's* (using Datagram Sockets) to one another. UDP is sometimes called the Universal Datagram Protocol

UDP squeezes extra performance from IP by not implementing some of the features offered by a more heavyweight protocols like TCP. Specifically, UDP allows individual packets to be dropped and UDP packets to be received in a different order than they were sent. Common network applications that use UDP include the Domain Name System (DNS), streaming media applications such as IPTV, Voice over IP (VoIP), Trivial File Transfer Protocol (TFTP) and online games.

2.3.4 Hyper Text Transfer Protocol (HTTP)

Hyper Text Transfer Protocol is the underlying protocol used by the World Wide Web. HTTP defines how messages are formatted and transmitted, and what action web servers and browsers should take in response to various commands. For example, when the user enters a URL in a browser, the browser actually sends and HTTP command to the web server directing it to fetch and transmit the requested web page.

Your browser connects to a
server and requests a   page

The server sends back the
Requested page

Client Machine with a Web Browser   **Web Server**

HTTP is based on request /response model. The client connects to the server and sends a request to the server. The request contains the following: request method, URL, protocol version. The client then sends some header information. The server's response includes the return of the protocol version, status code, followed by a header that contains server information, and then the requested data. The connection is then closed.

These are the four stages behind HTTP. They are

REQUEST – client send request to server for example you want to access the page named http://www.bdu.ac.in/mca.html is a request for the document named login.html. The browser maps this string into an HTTP request.

Headers – After the requests, the client can include additional information for the server. These request headers state some key facts about the clients.

RESPONSE – after the client sends the request, the server processes it and returns a response. The first line of the response is the status line, which states the status of the request. After the status line, the server sends response headers that states facts about the responses.

GET/POST methods – HTTP responses can be one of several types, called methods. The two most important methods are get and post.

The Get method is used for retrieving information from the server; the post method is used for sending information to a server, for example, placing an order for a book at Amazon. When you type an URL into your browser or click a link the GET method is being used. When you submit a complicated form the POST method is typically being used. The difference between GET and POST is that GET requests are intended to be used to send only a relatively small amount of information to a server. POST commands, on the other hand, can be used to send a virtually unlimited amount of data to the server.

HTTP is stateless protocol which means that a different connection between a client and server is established for each request.

2.3.5 File Transfer Protocol (FTP)

FTP stands for file transfer protocol. It is both a program and the method used to transfer files between computers on the Internet. Anonymous FTP is a type of FTP that lets you transfer any files from several thousand computers on the Internet to your personal computer or computer account. By using FTP the Internet becomes a huge disk drive attached to your computer. FTP sites contain book, journals, software's, games images, sound, multimedia courseware, databases and other information available for you to transfer. There is variety of FTP programs but all works in same way.

FTP uses Archie server. An agent who uses normal FTP commands to get directory listing of all the files on hundreds of anonymous FTP sites around the world. It then puts these file listings into a database and provide a simple interface for searching it.

### 2.4 Remote Access and Transactions

2.4.1 Telnet

Telnet is a program that allows login to other Internet computers and use on-line databases library catalogs, various information servers such as WAIS, chat with other users, read electronic journals, etc. To telnet to a computer, you need to know its name. This can either be in words, like "india.univ.edu" or as a numeric address like "192.168.9.34". Some devices require you to connect to a specific "port" on the remote computer. Type the port number, if there is one after the Internet address (for example "www.univ.edu:80").

2.4.2 Gopher

Gopher provides menu access to a wealth of different Internet resources, It is client/server based tools that providers a user-friendly front end to many different types of Internet resources located all over the world. By using Gopher you are spared from having to learn many of the arcane Internet and special computer commands. In effect, Gopher presents the Internet as if it were all part of a single directory system such as directories on a DOS machine or folder on a Mac. When you select a menu the Gopher tunnels through various Internet pathways to find the information you want and bring it back to you. Gopher can connect you to on-line databases, library catalogues. WAIS databases, World Wide Web websites. FTP sites and more. There are Gopher clients on most campus systems. To use Gopher log on to your account and type "gopher". There are also popular Gopher clients for DOS, X-windows, windows and Mac machines.

2.5 Electronic Mail

E-mail, short for electronic mail, is a system in which a computer user can exchange messages with other computer users using a communications network. To use e-mail, you must have access to a computer that is linked to the outside world, via a modem, phone line or fiber optic cable (Ethernet).
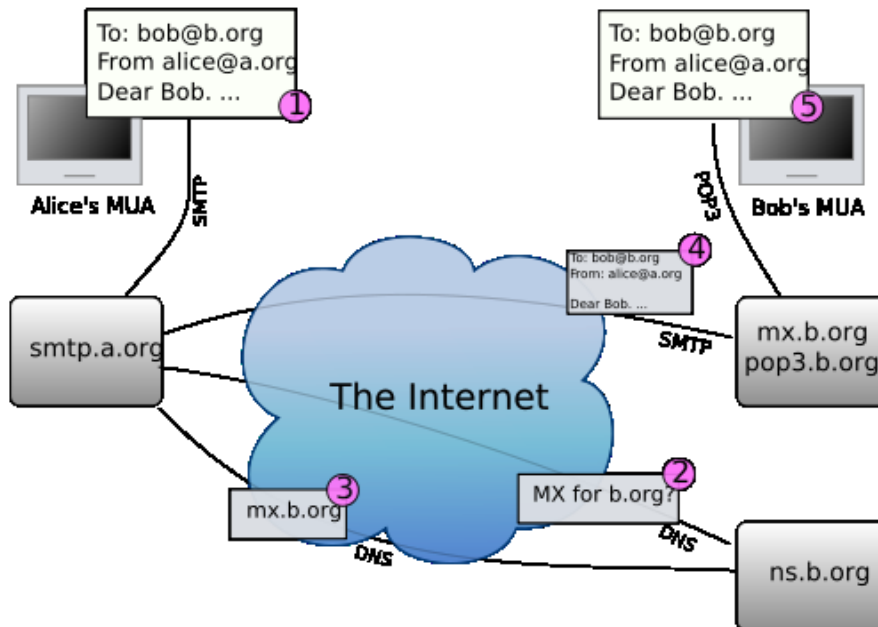
The diagram above shows a typical sequence of events that takes place when Alice composes a message using her mail user agent (MUA). She types in, or selects from an address book, the e-mail address of her correspondent. She hits the "send" button.

1. In the first stage the Alice's message in Internet e-mail format uses the Simple Mail Transfer Protocol (SMTP) to pass the message to the local server.
2. The (**M**essage **T**ransfer **A**gent) MTA looks at the destination address provided in the SMTP protocol, in this case bob@b.org. The part before the @ sign is the **local part** of the address, often the username of the recipient, and the part after the @ sign is a domain name. The MTA looks up this domain name in the Domain Name System to find the mail exchange servers accepting messages for that domain.
3. The DNS server for the b.org domain, is ns.b.org, responds with an MX record listing the mail exchange servers for that domain, in this case mx.b.org, a server run by Bob's ISP.
4. smtp.a.org sends the message to mx.b.org using SMTP, which delivers it to the mailbox of the user bob.
5. Bob presses the "get mail" button in his MUA, which picks up the message using the POP or IMAP Protocol

Mail clients

E-mail messages are generally sent to an e-mail server that stores received messages in the recipient's e-mail mailbox. The user later retrieves these messages with either a web browser or an e-mail client that uses one of a number of e-mail retrieval protocols. There are different types of mail clients protocol used to retrieve the user's mail account from mail server they are

- Post office protocol
- Internet Message Access Protocol

2.5.1 Post Office Protocol

POP is one of the email client uses TCP/IP Protocol. The design of POP3 and its procedures supports end-users with intermittent connections (such as dial-up connections), allowing these users to retrieve e-mail when connected and then to view and manipulate the retrieved messages without needing to stay connected.

Although most clients have an option to *leave mail on server*, e-mail clients using POP generally connect, retrieve all messages, store them on the user's PC as new messages, delete them from the server, and then disconnected. The main disadvantage of POP is the mail gets scattered wherever they access their account.

2.5.2 Internet Message Access Protocol

IMAP supports both connected (online) and disconnected (offline) modes of operation. E-mail clients using IMAP generally leave messages on the server until the user explicitly deletes them. This and other facets of IMAP operation allow multiple clients to access the same mailbox. Most e-mail clients support either POP3 or IMAP to retrieve messages; however, fewer Internet Service Providers (ISPs) support IMAP. IMAP4 offers access to the mail store; the client may store local copies of the messages, but these are considered to be a temporary cache; the server's store is authoritative.

For example, Microsoft's Outlook client typically uses a proprietary protocol to communicate with an Exchange server as does IBM's Notes client when communicating with a Domino server, but all of these products also support SMTP, POP3, and IMAP4. Support for the Internet standard protocols allows many other e-mail clients such as Pegasus Mail or Mozilla Thunderbird to access these servers and similarly allows the clients to be used with other servers .E-mail clients can generally be configured to use either POP3 or IMAP4 to retrieve e-mail and in both cases use SMTP for sending.

Nearly all subscribers to individual Internet service provider e-mail accounts access their e-mail with client software that uses POP.

IMAP is often used in large networks; for example, a college campus mail system. IMAP allows users to access new messages instantly on their computers, since the mail is stored on the network. With POP3, users either **download** the e-mail to their computer or access it via the web. Both methods take longer than IMAP, and the user must either download any new mail or "*refresh*" the page to see the new messages.

2.6 Search Engines

One must have probably heard of them but have only a vague idea of what they might be or do on the Internet. Well's here's what a search engine means. The engines mentioned above are different names for the same type of program, which are referred to as a Robot. In essence, a Robot is a specialized program designed to move through the World Wide Web, collecting data from each Website it encounters. This data usually includes the text from that page's title, headings and main body. This recorded text is sent by a Robot to a data-base where it is indexed and stored.

A query is sent to a search engine to do a search. It looks through this data-base for the words entered into its "query box".

It should be known that a search engine is not an intelligent thing. If asked to search for "travel in India", it would not go out and find all the sites on the Internet that area about collecting information on travelling in India. What it would do is look through all the Internet pages it has indexed in its data-base for the ones that contain the words "travel" and "India" and ignoring "in" or close matches to them, and then give you a list of the sites containing those words. It is very important to understand that the search engine is only matching the words given to the words in its index. So, just because an Internet site has the query word (or words) in it somewhere does not mean that it has the real content one is looking for
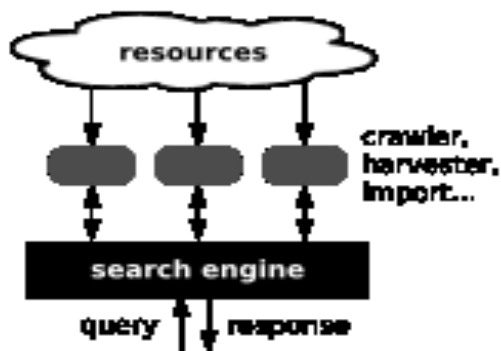
In addition, if several words are entered into a search engine's query box, the list of sites it returns may include pages that contain only one out of all the words you entered. Search engines will find a huge number of sited on the Internet that contains the word or words that one is looking for. So, to be helpful, they will put the ones that were most "relevant" to the search at the top of the list. This "relevancy" is based on many things, including how many times the word or words appeared in the site, how close they were to the beginning of the page's text how closely they match the word or words entered.

They not only let you search across a variety of engines simultaneously, but they also let you specify which engines you would like to use.

Which Internet Search engine is best? They all their strengths and weakness, and your best bet are to learn how to use an entire compilation of them.

Some popular search engine

Google

Google is the most popular search engine on the web. Google indexes billions of Web pages, so that users can search for the information they desire, through the use of keywords and operators. Google has also employed the Web Search technology into other search services, including Image Search, Google News, the price comparison site Google Product Search, the interactive Usenet archive Google Groups, Google Maps and more.
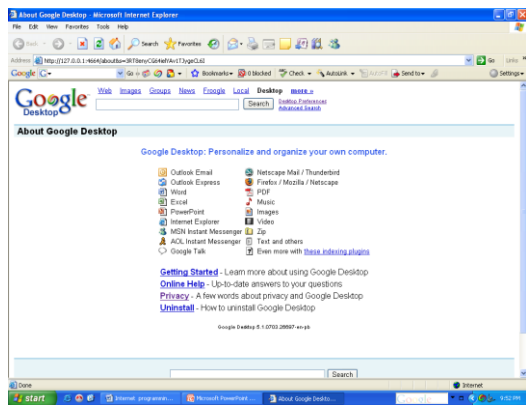
Yahoo

A very good search engine, people remember it as a huge database of many topics from education to entertainment, from health to information about any region, city or a country.

Lycos

Lycos frequently asked questions give a good explanation of how the search engine works. Search results are presented with a lot of information about each site retrieved so that a decision can be made about the relevance of the site without having to jump to that site.

Web crawler

Web crawler is a search engine that provides very good explanations in an indexed format, Content of sites, indexed as well as files and URL's are mentioned as the results.

2.7 Summary

- TCP/IP is the internet protocol specifies an addressing scheme for computers TCP/IP sets the rule for how data should move between computers and programs on the network.
- HTTP defines how messages are formatted and transmitted, and what action web servers and browsers should take in response to various commands. It process through request and response methods.
- FTP allows you to transfer various types of file formats from one machine to another machine on network.
- Telnet allows to access remote machine, Gopher presents the Internet as if it were all part of a single directory system such as directories on a DOS machine or folder on a Mac.
- E-mail stands for electronic mail which allows you to send messages from one computer to another over network. This uses the SMTP (simple mail transfer protocol).
- The mail stored on the server is retrieved to user's accounts through various client protocols like POP3, IMAP3.
- Search engines are used to find our favorite websites by specifying the keyword.

2.8 Check your Progress

1. HTTP stands for ………………………………
2. FTP Protocol is used to ………………………….
3. List out the methods used in HTTP Protocol
4. List the remote access Protocol.
5. Illustrate the role played by TCP/IP in the Internet communication.
6. Explain HTTP and its components.
7. List out the various type of mail? Explain it.
8. Differentiate between POP3 and IMAP protocol.
9. What are the protocols used for remote login? Explain.
10. Describe the use of web index in search engine.

2.9 Verify your Answers

1. Hyper Text Transfer Protocol
2. FTP is used to transfer various type of file from one computer to another computer.
3. GET method, POST method
4. Telnet and Gopher.

2.10 Activities

1. Go to the website www.howstuffworks.com and study about the how email works.
2. Make a comparison between POP and IMAP protocol.
3. Prepare an assignment about various Search engine and its advantages.
4. Search Google a using specific query and analyze its results.